Remarks

Applicant and his attorney thank the Examiner for allowance of claims 59, 60 and 70. Claims 72 corresponds to claim 59, new claim 73 corresponds to claim 60 and new claim 74 corresponds to claim 70. Claims 61-66 have been canceled in view of the restriction of the last office action. Independent claims 48, 52, and 67 have been amended to address the Examiner's section 112 rejection of those claims. Finally, applicant transmits with this amendment the same substitute specification filed in SN 10/744,491 which has method claims and which applicant believes has been recently examined by the Examiner.

The Section 112 Rejection Has Been Obviated.

The Examiner made the same type of rejection in the "method case" (SN 10/744,491) in an office action mailed on March 7, 2006. It is applicant's understanding that the amendment of the claims in that "method case" solved the section 112 problem. Applicant has amended independent claims 48, 52, and 67 in the instant application in the same way as the method claims were amended. The idea of heating and cooling to crystalize have been put into each of the independent claims. Applicant submits the amendments should solve the section 112 problems raised by the office action. ***If any further amendment is required, however, the applicant and his attorney ask the Examiner to call the undersigned before any further office action.***

New Claims 72, 73, and74 Should be Allowed In View of the Last Office Action.

The Examiner has indicated that claims 59, 60 and 70 are allowable. Claims 72-74 are the claims which the Examiner has allowed, dependent claims plus intermediate claims.

Claim 72 is claim 52 + 55 + 54 + 59. Claim 72 should be allowed.

Claim 73 is claim 52 + 53 + 57 + 60. Claim 73 should be allowed.

Claim 74 is claim 67 + 69 + 70. Claim 74 should be allowed.

Conclusion.

The applicant has rewritten claims 59, 60 and 70 into independent form. These claims now should be allowed as they were found allowable in the last office action. Further independent claims 48, 52, and 67 have been amended to solve the section 112 rejection of those claims.

Finally a substitute specification is filed herewith to match the specification filed in the "method case". Applicant respectfully requests allowance of the pending claims.

The Commissioner is hereby authorized to charge any additional fees which may be required in this application to Deposit Account No. 06-1135.

Respectfully submitted,

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COATING FOR INSULATION MATERIAL ~~AND METHOD FOR MANUFACTURING THE INSULATION~~

Field ~~Background art~~

The invention relates to building materials and applies to a coating for an insulation material. The coating includes metal, such as ~~aluminium~~ aluminum. The invention also ~~applies~~ relates to the manufacture of the coating, and its use in insulation materials. The invention is suitable for use, for ~~instance~~ example, in insulation materials ~~that include~~ containing ~~expanded~~ cellular plastics or fibre wool.

Background

Various ~~Building technology uses different~~ insulation materials, in which a coating has been joined to a porous insulation layer, are applied in construction technology. The coating can be used to improve the insulating properties, durability, fire safety, dimensional stability, or the appearance of the material.

~~Aluminium~~ Aluminum foil is often used in the coatings of insulation materials. It is impermeable to gases and is incombustible, and reflects thermal radiation. The ~~aluminium~~ aluminum ~~sheet~~ foil is joined to the insulation layer by means of a plastic adhesion layer. The insulation material is manufactured in the following manner: firstly, the adhesion layer is joined to the ~~aluminium~~ aluminum sheet, after which the laminate that has thus been produced is joined to the insulation layer. This can be done, for ~~instance~~ example, ~~onto~~ with polyurethane while it is still in a reactive state, whereby the layers self-adhere without separate gluing. When there is a gas-tight ~~aluminium~~ aluminum layer against the layer of ~~expanded~~ cellular plastic, the propellants in the ~~expanded~~ cellular plastic remain inside it to an optimal degree.

One problem here is, however, the ~~coating's~~ insufficient strength of the coating ~~in~~ during the manufacture of the insulation material. The aluminium aluminum sheet ~~tears easily~~ is easily torn when it is pulled into the machine. For example, ~~when~~ during the coating of a polyurethane insulation that is still forming, ~~the resulting malfunction~~

~~causes extremely great disadvantage~~ failures are particularly harmful, as the ~~swelling~~ expanding polyurethane foam is spreads and stains the production machinery and ~~premises~~ floor. In fact, the primary function of the coating in such a situation is to protect the process machinery from reactive and sticky insulation material in the initial phase of the process.

Summary ~~**General disclosure of the invention**~~

The present invention relates to a coating for an insulation material ~~as claimed in claim 1. Its caharacteristic feature is that it comprises~~ comprising a metal layer, such as an ~~aluminium~~ aluminum layer, ~~to which is joined~~ and a plastic layer ~~containing a~~. The plastic layer contains a plastic that ~~crystallises~~ crystallizes when heated. The plastic layer is adhered to the metal layer. The plastic is such that it can be joined to the metal film particularly by extrusion. The plastic may be a polyamide, such as polyamide-6 or polyamide-66. The ~~heat~~ temperature at which the plastic ~~crystallises~~ crystallizes may be, for ~~instance~~ example, 100 to 160°C. ~~There may be an~~ An adhesion layer can also be provided between the metal layer and the plastic layer.

The invention also ~~concerns~~ relates to a method for producing an insulation material coating ~~as claimed in claim 2, in which method a coating as claimed in claim 1 is manufactured by extrusion~~ in which a metal layer, such as for example, an aluminium aluminum layer, is joined by extrusion to a plastic layer containing extrudable plastic that crystallizes when heated.

The invention also ~~concerns~~ relates to a manufacturing method for an insulation material ~~as claimed in claim 3,~~ in which ~~method~~ a coating ~~as claimed in claim 1 is used~~ is joined to an insulation layer such as expended plastic or fiber wool. The coating contains a metal layer, such as for example an aluminum layer, and a plastic layer. In the method, the coating is joined to an insulation layer, and the plastic layer comprises plastic that crystallizes when heated. The plastic layer is heated so that the plastic ~~crystallises~~ crystallizes. ~~The~~ In particular, the insulation layer may ~~more particularly be~~ consist of an expanded or cellular plastic, such as polyurethane or polystyrene. ~~In this case, the~~ The coating can thus be ~~joined~~ attached to the insulation layer while the

insulation layer is being formed. When the forming of the insulation layer is ~~exothermal~~ exothermic, the heat that is generated can be utilized in ~~crystallising~~ crystallizing the plastic of the plastic layer.

During the process of manufacturing the insulation material, the plastic layer protects the coating, especially from tearing. While ~~crystallising~~ crystallizing, the plastic layer becomes rigid, and thus the insulation material gains solidity and surface strength.

The invention also ~~concerns~~ relates to an insulation material ~~as claimed in claim 8, which material is manufactured by using~~ with an insulation layer having a coating ~~in as claimed in claim 1, in which the~~ joined to it where the coating includes a metal layer, such as for example an aluminium aluminum layer, and a plastic layer ~~includes~~ which contains a polyamide that ~~crystallises~~ crystallizes when heated.

Brief Description of the Drawings

FIGURE 1 is a side view of an embodiment of the invention having an expanded polymer;

FIGURE 2 is a side view of an alternate embodiment of the invention;

FIGURE 3 is a side view of an alternate embodiment of the invention having a fibrous material; and

FIGURE 4 is a side view of an alternate embodiment of the invention.

Detailed Description ~~description of the invention~~

In the embodiment ~~as~~ shown in figure 1, a layer 2 (e.g. ~~approx~~ about 30 g/m^2), ~~including~~ containing a polyamide-6 that ~~crystallises~~ crystallizes when heated, has first been ~~joined~~ attached to an ~~aluminium~~ aluminum layer 1 (e.g. ~~approx~~ about 50 μm). The coating thus obtained has been joined to the foamed polyurethane layer 3 in such a way that the polyamide layer remains ~~between them~~ therebetween, and the polyamide layer 2 has been heated in order to ~~crystallise~~ crystallize the polyamide.

In order to improve the adhesion between the ~~aluminium~~ aluminum layer 1 and the polyamide layer 2, ~~there is~~ an adhesion layer 4 ~~between them~~ containing a suitable adhesive plastic is provided between them. Correspondingly, ~~in order~~ to improve the adhesion between the polyamide layer 2 and the polyurethane layer 3, ~~there is~~ an adhesion layer 5 is provided between them. Furthermore, the outer surface of the ~~aluminium~~ aluminum layer 1 is coated with a surface layer 6 (e.g. HD-polyethylene). The surface layer 6 may ~~include~~ contain necessary additives, ~~more~~ particularly a fire retardant.

A product according to figure 1 can be manufactured ~~more~~ particularly ~~in such a way that~~ by first attaching an adhesion layer 4, a polyamide layer 2, an adhesion layer 5, and a surface layer 6 ~~are joined~~ to the ~~aluminium~~ aluminum ~~sheet~~ foil 1 by ~~extruding~~ extrusion in several ~~phases~~ steps. The extrusion is carried out in such a way that the polyamide ~~does~~ will not ~~yet~~ substantially ~~crystallise~~ crystallize. The coating ~~1~~ thus formed is ~~joined~~ attached to an expanded or cellular polyurethane layer 3 while it is being formed. The forming reaction of polyurethane is ~~exothermal~~ exothermic, whereby the coating ~~also heats up~~ is also heated. During the manufacturing process, the polyamide layer 2 is ~~allowed to heat up~~ heated to the ~~crystallisation heat~~ crystallization temperature of polyamide (e.g. 120 to 140°C, such as 125 to 135°C, typically ~~approx.~~ about 130°C), whereupon the polyamide ~~crystallises~~ crystallizes. The necessary ~~crystallisation~~ crystallization time may be, for ~~instance~~ example, ~~be~~ 1 to 5 minutes. ~~When choosing~~ In the selection of the polyamide, its extrusion properties are also taken into account.

~~By using~~ Using the coextrusion technique can reduce the number of manufacturing phases ~~can be reduced~~.

The polyamide in the polyamide layer 2 is flexible and glutinous or viscous when ~~uncrystallised~~ uncrystallized. Thus, the coating is ~~easy to run on the machine~~ easily runnable, and it withstands the process well without tearing. When it ~~crystallises~~ crystallizes, the polyamide layer ~~strengthens and stiffens~~ becomes stronger and stiffer, thereby producing an insulation material that is sufficiently strong and stiff in use. The ~~crystallised~~ crystallized polyamide also increases bursting ~~resistance~~ strength.

In the embodiment shown in figure 2, there is an ~~aluminium~~ aluminum layer 1.1, on top of which a polyamide-6 layer 2.1 has been ~~joined~~ applied. The coating thus formed has been ~~joined~~ attached to the polyurethane layer 3.1 in such a way that the ~~aluminium~~ aluminum layer 1.1 remains ~~between them~~ therebetween.

In order to enhance the adhesion of the ~~aluminium~~ aluminum layer 1.1 and the polyamide layer 2.1, ~~there is~~ an adhesion layer 4.1 is provided between them. The adhesion layer 4.1 may contain a pigment, more particularly a white pigment. Correspondingly, in order to increase the adhesion between the ~~aluminium~~ aluminum layer 1.1 and the ~~expanded~~ cellular polyurethane layer 3, ~~there is~~ a lacquer layer 7 (e.g. ~~approx~~ about 2 µm) is provided between them.

The ~~Insulation~~ insulation material according to figure 2 can be manufactured similarly to the material according to figure 1, described above. The coating can be formed by ~~coextruding~~ coextrusion in two ~~phases~~ steps, more particularly ~~in such a way that, firstly,~~ by attaching first a polyamide layer 2.1 and an adhesion layer 4.1 ~~are joined~~ to each other, and then these layers to an ~~aluminium~~ aluminum layer 1.1 and an adhesion layer 7.

In the embodiment shown in figure 3, there is a layer of fibre wool 8 (e.g. mineral wool, ~~approx.~~ about 50 mm), on top of it a layer of a non-woven mat 9 (e.g. glass fibre mat, ~~approx.~~ about 50 g/m^2), a plastic layer 10 (e.g. polyethylene ~~approx.~~ about 40 g/m^2), an adhesion layer 5.1 (e.g. ~~approx.~~ about 2 µm), a polyamide layer 2.2 (e.g. ~~approx.~~ about 30 µm), an adhesion layer 4.2 (e.g. ~~approx.~~ about 2 µm), a layer of ~~aluminium~~ aluminum foil 1.2 (e.g. ~~approx.~~ about 50 µm), and a lacquer layer 6.1 (e.g. ~~approx.~~ about 3 µm). During the manufacture, heat is ~~passed~~ introduced from above through the entire layer. Melting occurs at a temperature of, for example, 140 to 160°C, typically at approximately 150°C.

~~In addition~~ Furthermore, figure 4 presents a product corresponding to figure 2, in which the insulation is a layer of polystyrene foam (EPS) 3.2. On top of it, there is a layer of

hot seal lacquer 7.1 (e.g. ~~approx.~~ about 2 µm), a layer of ~~aluminium~~ aluminum foil 1.3, an adhesion layer 4.3 (e.g. ~~approx.~~ about 2 µm), and a polyamide layer (e.g. about 30 µm). In ~~manufacturing~~ the manufacture, the heat is applied from above. The polystyrene foam 3.2 melts and adheres to the hot seal lacquer 7.1.

~~Insulation~~ The insulation materials according to the invention can be manufactured ~~so that they~~ to meet ~~the~~ fire regulation norms.

What is Claimed is:

1. A coating for insulation material comprising a metal layer and a plastic layer, wherein the plastic layer contains plastic that crystallises when heated.
2. The coating of claim 1 wherein the metal layer is an aluminum layer.
3. A method for manufacturing a coating for insulation material comprising joining a metal layer and a plastic layer to each other by extrusion, wherein the plastic layer contains extrudable plastic that crystallizes when heated.
4. A method for manufacturing insulation material comprising:

joining a coating material to the insulation material, wherein the coating material includes a metal layer and a plastic layer, wherein the plastic layer includes plastic that crystallizes when heated; and

heating the plastic layer in an amount effective for crystallizing the plastic.

5. The method of claim 4 wherein the metal layer is an aluminum layer.
6. The method of claim 4 wherein the plastic layer contains a polyamide selected from the group consisting of polyamide-66, polyamide-6 and mixtures thereof.
7. The method of claim 4 wherein the plastic layer is heated to about 100 to about 160°C.
8. The method of claim 4 wherein the insulation material includes an expanded plastic or fiber wool.
9. The method of claim 8 wherein the expanded plastic is expanded polyurethane or expanded polystyrene.
10. The method of claim 4 wherein the insulation layer is joined to the plastic layer during formation of the plastic layer.
11. The method of claim 10 wherein during the formation of a plastic layer, an amount of heat is generated that is effective for crystallizing plastic in the plastic layer.
12. An insulation material comprising a coating joined to an insulation layer, the coating included a metal layer and a plastic layer, the plastic layer includes a polyamide that can be crystallized with heating.

13. The insulation material of claim 12 wherein the metal layer is an aluminum layer.

14. The insulation material of claim 12 wherein the plastic layer that includes a polyamide layer is placed against the insulation layer.

15. The insulation material of claim 12 wherein there is a layer that is effective for enhancing adhesion between the coating and the insulation layer.

Abstract

The invention relates to a coating for insulation material, which coating comprises a metal layer, such as an aluminum layer, and a plastic layer. The plastic layer contains plastic that crystallises when heated. The plastic can more particularly be a polyamide.

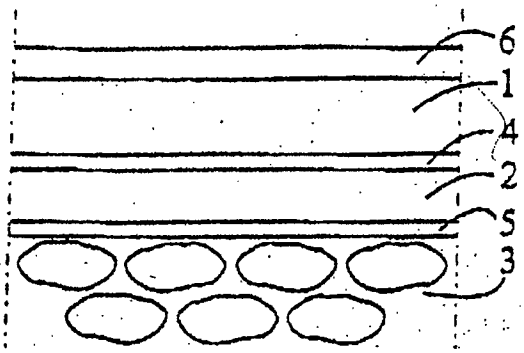

Fig. 1

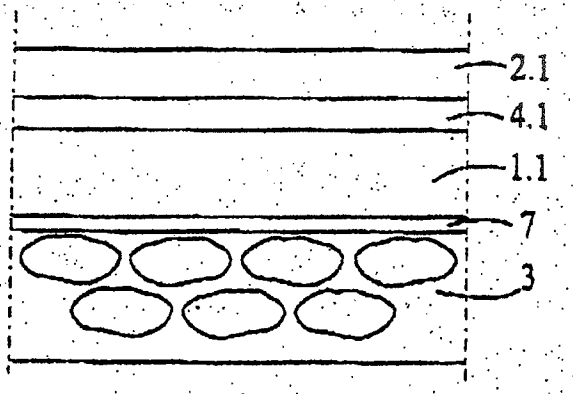

Fig. 2

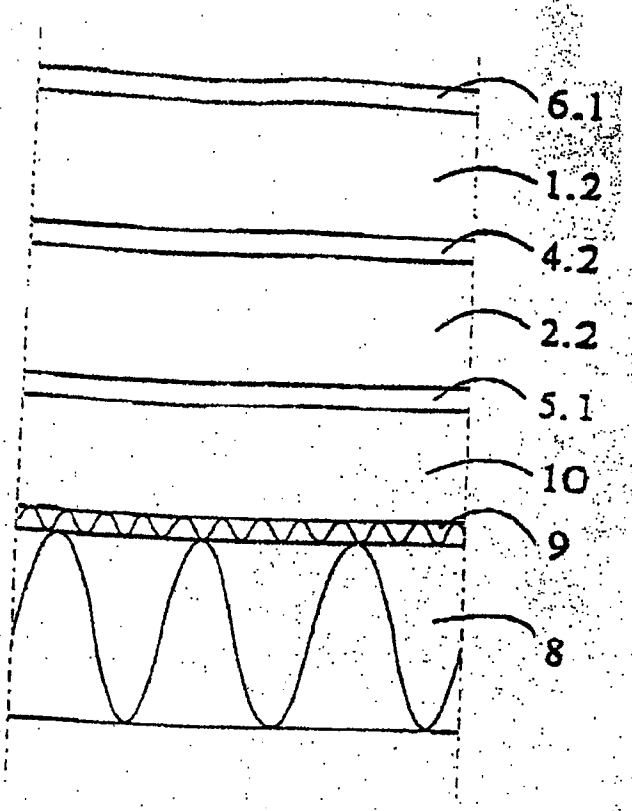

Fig. 3

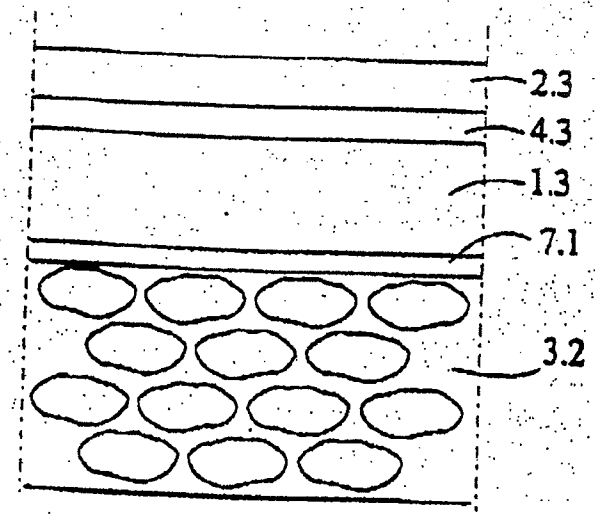

Fig. 4